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THE AGRICULTURAL STUDENT

A MONTHLY MAGAZINE DEVOTED TO AGRICULTURAL EDUCATION.

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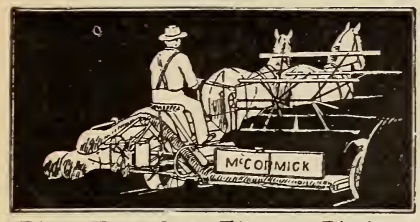

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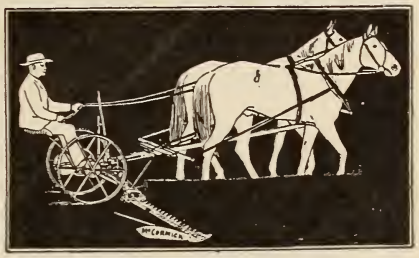
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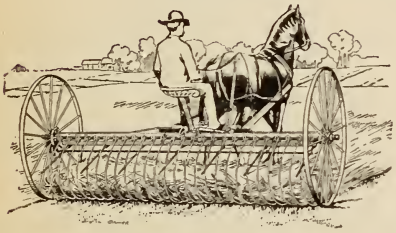
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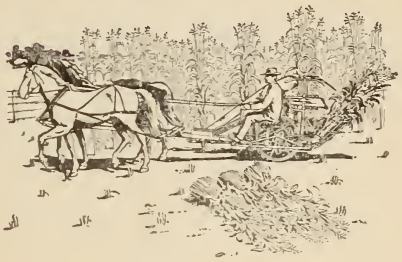
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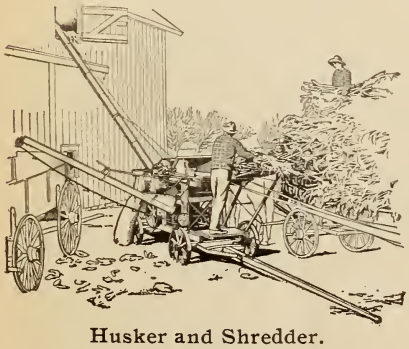
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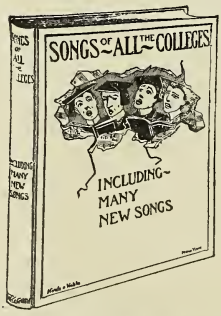

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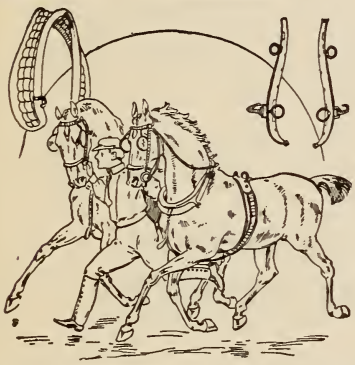

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Consult the Catalogue for the particulars in any of these departments. Shorter courses in the Colleges of Agriculture and Engineering are provided for the convenience of those who cannot pursue the full courses. Superior opportunity is offered for the study of Dairying.

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The World's Work for January.

With "The New Era of Exclusiveness Is Past" for a text The World's World for January devotes its space largely to the political and commercial expansion of the country. Nearly every article gives not only vivid incidents of America abroad to date, but is full, as well, of suggestions toward making the incidents of our trade in every limits of the earth a great unified movement. In "Our New Horizon" Frederic Emory gives, with epic sweet, a view of our new activities. Chalmers Robert relates stories of American ministers abroad, and Gaillard Hunt, in a splendidly illustrated article, tells how the consular service, which is doing much to further American influence at the outposts, should be reorganized. The rapid growth of Pacific Coast trade is stirringly shown in "The New Pacific Empire," by George Hamlin Fitch, and a striking incident in it is told by Arthur Goodrich in his description of the building of the biggest ships in the world, "Merchantmen Twice As Big As Men-of-War," to ply between Seattle and the Orient. The so-called American invasion of England is discussed by Ulysses D. Eddy in "Our Special Partner—England," and in "More Stories" by an American in England. Remarkable developments in our trade with Spain since the war are related by Edward Lowry, and Henry Harrison Lewis tells of the adventures of American goods abroad. The new relations with the people of our own continent are interpreted by Oscar King Davis, writing from the Pan-American Congress in Mexico, and W. Woodville Rockhill, the Director of the Bureau of American Republics. Handsomely illustrated articles of the famous Briarcliff Farm in New York, by Mary C. Blossom, and a "Day's Work on a Cattle Ranch," by Earl Mayo, give variety to this special "looking outward" number. Many stories and interesting facts about our foreign trade are told in "Among the World's Workers, in which appear, also, letters from consuls stationed in various lands. The number is a valuable and vividly interesting contribution to the literature of American progress.

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The New Agricultural Building, University of Illinois.

THE AGRICULTURAL STUDENT.

VOL. VIII. OHIO STATE UNIVERSITY, COLUMBUS, JANUARY, 1902. No. 5.

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CONTENTS.

Editorial Chat 38
Agricultural College News 85
The Chicago Live Stock Show ... 86
The Cranberry Industry is a Big One 86
Professor William D. Gibbs... .. 87
Merritt F. Miller, Successor to Professor Gibbs 88
The Special Dairy Class for 1902 89
Grain Weevils 90
Sheep—by T. L. Wheeler 91
The Soil and the Plant 93
Annual Report of the Secretary of Agriculture 96

EDITORIAL CHAT.

In this number of THE STUDENT we devote considerable space to the Annual Report of the Secretary of Agriculture. Never before in the history of the Department has the annual report been so favorably received, and its suggestions so seriously discussed by the press and thinking people all over the land.

"It is easy to remember," says the *Rural New Yorker,* "when the annual report of the Secretary or Commissioner of Agriculture was regarded by the daily papers as a joke, or dismissed with a few lines. City people were then disposed to laugh at the efforts of organized agriculture to gain dignity and business standing. We realize what a gain has been made in the minds of those same people when we see how Secretary Wilson's report for this year is received. The leading papers devote columns to a synopsis of it, and discuss its suggestions seriously. The National Agricultural Department, once laughed at, is now respected, and its value is admitted. The careful work of the present Secretary is responsible for this gain in dignity. The common farmer may say that all this means nothing to him. He is wrong, for as the general business of

farming gains in character and the power to command respect, the poorest man on the farm will find it a worthier profession."

Perhaps few of the traveling public know that the large railroads are fast becoming the largest landscape gardeners in the country. Beginning with a few flower beds and as many rods of well-kept green around the larger stations, the work was extended to include the smaller stations also. It soon became evident that every dollar spent in this manner was a good business investment and within the last few years hundreds of miles of track have been transformed into veritable gardens. Not content with this, in many cases large tracts of land adjoining the tracks, and commanding especially fine views, have been purchased for the purpose of improvement and beautifying for the pleasure of their patrons.

The American Gardening gives the following under the caption of "Promoting the Beautiful":

The recent appointment of C. J. Leavitt, civil engineer in the employ of the New York Central Railroad, to a new position with the title "landscape gardener-in-chief" marks progress in an important department of railroad business. It may seem odd to many that landscape gardening should have any connection with railroading. It has, however, and it is constantly growing in importance. The old idea that a railroad right of way is necessarily a barren waste, even when surrounded by fertile territory, is rapidly passing.

The New York Central, Pennsylvania, and a few other roads began a system of improvement a good many years ago. Certain places along their lines were selected for the creation of flower beds and shrubberies, much to the delight of their patrons. Those small beginnings have expanded into ambitious schemes of gardening a large part of the mileage of these companies, and the creation by the New York Central of a special department for that purpose. It is a proper function of a railroad system to exhibit to its patrons the most approved ideas in landscaping or beautifying grounds. The example has already exerted widespread influence, inciting private effort to beautifying unattractive premises.

The time will come when the traveler along other highways than the railroads will be greeted at every turn by a new spectacle of color and arrangement. But first the roads must be improved. An exquisite garden can appeal with but little force to a man driving upon a rutted and muddy thoroughfare.

Perhaps nothing has been more talked of in the circle of agricultural colleges during the last fall than the students' judging contest recently held at Chicago. The promoters of the plan certainly deserve great credit, and the interest manifested is certainly proof that their efforts have been appreciated. However, in our eagerness to win the prize there seems to be some danger that the benefits of such contests may be largely counteracted. The contest purported to be a contest between the students of the various agricultural colleges. This was true in the contest for the cash prizes only to a certain extent, and in the contest for the "Spohr Trophy" it really resolved itself into a contest between the universities. In some instances the students who were to represent the University in the contest were chosen very early in the fall, and practically all their time was devoted to training for the contest. This cannot help but be a detriment to the student in the end. Such contests are after all separate and outside of the col-

lege work; useful adjuncts to be sure, but yet secondary.

No university of standing will allow a man to represent her in an intercollegiate game of any sort, who is not carrying the full quoto of required college work and in good standing in the same. The same rule should apply in judging contests, or any other events of an intercollegiate nature. Again, to give such special training the time and attention of the instructor is taken from the other students, thus working them an injury. It should be remembered first, last and always, that required college work comes first. Other things are secondary, else the student should not be in college. Let the instructors and students give and obtain as much training as possible for such things without lowering the standard of class work. If a student cannot carry his full quota of college work and at the same time train for an intercollegiate contest whether in football or stock judging, let it not be his college work that must suffer, thus not only injuring himself but debasing a good thing to the common level of professionalism.

At the next session of Congress the friends of the Grout bill will again attempt to bring it to a vote. The bill was defeated at the last session only by preventing its coming to a vote. The opponents have been active during the interval and are determined to defeat it. All that is necessary to make the Grout bill a law is for the dairymen of the country to arouse themselves to their own interests. Write to your Congressman and ask him to vote for the bill. If every dairyman in the country would do this not a Congressman would dare withstand the pressure. Write at once.

Beginning with this number THE STUDENT will contain a Dairy page, giving the news of the Dairy School, the dairy students and former graduates. Professor Decker will have charge of the page. Every dairy student should subscribe for THE STUDENT and keep posted on the progress of the University and the whereabouts of his classmates.

Agricultural College News.

E. H. Twight, a graduate of the Viticultural College of Montpellier, France, has been appointed Assistant in Viticulture in the California University and Station.

C. P. Chase of the Utah College and Station has been appointed horticulturist in the Delaware College and Station.

A. R. Ward, formerly of Cornell University, has been appointed veterinarian of the California Station.

H. E. Van Norman, Farm Superintendent and Assistant in Dairying at the Purdue University, has been promoted to Instructor in Dairying at the University and Dairyman of the Station.

R. C. Obrecht, B. S. Agr., Iowa, has been appointed Assistant in Animal Industry at Purdue University.

Mr. F. C. Mellen, B. S., Ohio State University, has been elected Assistant Chemist in the Kansas College and Station.

W. L. Howard, B. S., University of Missouri, has been elected Assistant Horticulturist in the Missouri Station.

O. F. Henziker has been appointed Station Bacteriologist at Cornell University.

L. E. Barnes, a graduate of the Iowa Agricultural College, has been appointed Dairyman at the Tennessee Station, to take the place of George A. Flickinger, resigned.

A. R. Whitson, Assistant Professor of Soil Physics at the University of Wisconsin, has been placed in charge of the department since the resignation of Professor F. H. King.

The Chicago Live Stock Show.

A party of thirty students and ex-students attended the Chicago Live Stock Show, held the first week in December, accompanied by Professor Hunt and Mr. Ruhlen. Sixteen students participated in the intercollegiate students' judging contest, but Ohio State was not represented at all in the contest for the "Spohr Trophy."

Mr. H. L. Belden won second place in a class of thirty-eight students from the various agricultural colleges, on Cotswold sheep. Mr. J. A. Folsom won fifth place in a class of thirty-nine on Clydsdale horses.

The party spent Wednesday morning as the guests of the Armour Company, through the courtesy of W. S. Kelch, Ohio Agent for the company. Dr. A. G. Manns, Head Chemist to the Armour plant, personally conducted the party through the establishment and explained the details of one of the largest packing-house industries in the world.

At noon the students were served with lunch as guests of the company. The party voted the trip an entire success and every one felt well repaid for time and money spent.

On Wednesday evening the American Federation of Agricultural Schools was organized, Iowa being the prime mover in the organization. Iowa, Minnesota, Missouri, Wisconsin, Indiana, Ontario, North Dakota, and Ohio State University chartered the constitution.

Illinois will have charge of the first annual meeting and will furnish the official corps. After the adjournment of the business session, the literary program was opened by an address of welcome by Mr. A. J. Lovejoy. Mr. C. C. Poindexter, representing Ohio State University, responded to the welcome address in an able manner.

Other addresses were delivered by representatives from Indiana, Illinois, Wisconsin, Minnesota and Iowa.

The "Spohr Trophy" was won by Iowa with a total average of 3756 points. Ontario was second, with 3519 points, and Illinois third, with 3488½ points.

The Cranberry Industry is a Big One.

One of the notable successes of 1901 is the cranberry industry; for, when the last of the yield was picked, an aggregate of one million bushels was reached. By comparing this with the yield of 1900, five hundred and sixty-nine thousand bushels, the success stands revealed.

The cranberry is as closely allied to the Christmas dinner as holly to the Christmas tree; but, of the millions who enjoy the tart berry, few know how it is cultivated. The berries are grown in bogs that cost from three hundred to five hundred dollars an acre. The soil in which they flourish is composed of peat and clean, sharp sand, the latter being absolutely essential to healthy growth.

The bush on which the berries appear grows about six inches high, and every year it puts out "runners that, in turn, take root and form new bushes; so that, when a bog first becomes productive, five years from the time of its beginning, it is thickly covered with bushes.

This growth is accentuated by a system of irrigation that keeps the bog water-soaked, though not to such a degree as to cause anything like a liquid state. The irrigating plan is most useful as a protection against frost; for,

when the grower believes a frosty night at hand, he opens the flood gate and allows the water to overflow his bog, until it is from eighteen to twenty-four inches over bush and berry. The next morning, the bog is drained, and the fruit picked.

The picking process is a simple one. It consists of placing the fingers, slightly spread, beneath a bush, and then, by an upward movement, raking the bush clean of its fruit. By means of a winnowing machine, the berries are freed from dirt and leaves. New York City, alone, consumes two hundred and fifty thousand bushels of cranberries every Christmas season.—*Success* for December.

Professor William D. Gibbs.

Most of our readers have heard with extreme regret of the resignation of Professor Gibbs, who goes to the New Hampshire State College as the Professor of Agriculture and Director of the Experiment Station.

William D. Gibbs was born in Illinois and spent his early years on the farm, gaining a practical knowledge of the profession to which he is devoting his life. He received his preparatory education in the common schools, and in the Winchester High School, graduating from the latter in 1888. The same year he entered the Agricultural College of the University of Illinois. Dur-

WILLIAM D. GIBBS,

Professor of Agriculture and Director of the Experiment Station, Durham, N. H.

ing his sophomore and junior years he was Foreman of the University farm, graduating in 1893. He was immediately appointed to a fellowship in his Alma Mater and returned the next year, pursuing special work in animal husbandry and history of agriculture. At the same time he taught bacteriology, and stock feeding, and receiving his Master's degree in June, 1894. The next year he pursued special post-graduate work in soil physics at the University of Wisconsin under Professor King, and in March was appointed Foreman of the farm and Assistant in Agriculture at the Ohio State University. Two months later he entered the Division of Soils, United States Department of Agriculture, as Expert Assistant in Soil Physics, and a few months later was tendered the position of Assistant Chief of the Division. This offer was rejected to accept the position of Assistant Professor of Agriculture at Ohio State University. Since that time Professor Gibbs has been rapidly advanced, having received the rank of Professor of Agronomy in June, 1900.

For several years Professor Gibbs has been an active and successful State institute lecturer, winning the confidence and respect of the farmers wherever he went. For the last three years he has been the business manager of THE AGRICULTURAL STUDENT, and to his efficient work the success of the magazine is largely due.

In the class-room Professor Gibbs was a model teacher; clear and forceful in the presentation of the subject in hand; maintaining a high standard of excellence, yet always ready to help and encourage, he had the esteem and confidence of every student who has ever been in his classes.

No better testimony of the thoroughness of his work can be had than the fact that many of his students are achieving marked success along the lines taught by him. One of these students is his sucessor to the position made vacant by his resignation.

By his co-laborers in the Faculty Professor Gibbs has always been held in the highest esteem as is shown by the resolutions published in the December STUDENT. Sincere and affable in manner and address, he has won for himself a host of friends who, while they are sorry to see him leave Ohio, rejoice in his advancement, and their best wishes go with Professor Gibbs and his estimable wife for a successful and happy career in their newly-chosen field of labor.

The best wishes of THE STUDENT go with Professor Gibbs always. While we mounr our loss we congratulate him on his advancement and New Hampshire upon securing his services in behalf of agricultural education in New England.

Merritt F. Miller, Successor to Professor Fibbs.

Merritt Finley Miller was born in Grove City, Franklin County, Ohio, July 7, 1876. He received his early education in the common schools and in the fall of 1895 entered Ohio Wesleyan. Attracted by the possibilities of higher education in agriculture he entered the Agricultural College at the Ohio State University in the fall of 1896, and graduated with the class of 1900. While in the University Mr. Miller made an enviable record as a faithful and conscientious student. However, his interest did not end with his class-room work, for he was found actively engaged in many general college enterprises. Mr. Miller was a member of Townshend Literary Society, Captain of Co. A, O. S. U. Battalion, and Associate editor of *The Lantern*. He is a member of Alpha Zeta fraternity. The subject of his bachellor's thesis was "The Evolution

MERRITT F. MILLER.

and Comparison of the Reaping Machines."

In the fall of 1900 he entered Cornell University and graduated with the degree of M. S. A. last June, immediately entering the Division of Soils, United States Department of Agriculture, as Field Assistant. While in Cornell, Mr. Miller made a special study of soils, and with his experience under Professor Whitney, he comes well equipped for the work before him as Assistant in Agronomy in his Alma Mater. A host of friends welcome him back to the University and wish him success in his new field of labor.

Other Changes in the Department.

Owing to Professor Gibbs' resignation it has been found necessary to make some changes in the teaching force. Mr. Miller will have all regular classes in soils and crops. Mr. Ruhlen will have charge of the classes in animal industry, and Professor Hunt will have charge of all the advanced classes. Mr. F. H. Hamilton will assume the management of the farm for the coming summer.

The Dairy School.

The Special Dairy Class for 1902.

On January 2d a new dairy class will begin work at O. S. U. The last class, numbering 52, was the largest in the history of the school, the high watermark previously being 29. In addition to this class of 52 special students there was a class of 27 regular students, making 79 taking work in the dairy laboratories.

In the interest of thorough work the special class has been limited to fifty. Forty-seven students from ten States are registered at this date, December 13, and a good many application blanks are in the hands of inquirers. This, of course, means that the school will be full.

A full line of dairy machinery will be in use this year as before. There will be six De Laval separators of different types, five United States machines, three Sharples tubular, including a steam turbine, and an Empire of the latest pattern, and also a National.

Messrs. C. N. Breese, E. F. Mangold, Clifton Tarpning, Frank Hudson and T. L. Wheeler will be the student assistants in the laboratories.

The dairy work, however, is no longer limited to the ten weeks in the winter term. A course which will extend through the three terms of the college year is being given for the first time this year. A class of ten students has been at work the past term. The fall term covers the constitution and testing of milk, the winter term butter making, and the spring term cheese making.

Two other courses of work have recently been started in the dairy depart-

ment. The Senior Veterinary class pursues a course in milk inspection during the fall term. The past term this class has numbered eight. A class of ten domestic science students have recently had special lectures and laboratory demonstrations on the composition and care of milk and its products. This work will appear as a new course in the next catalogue.

These courses are coming into existence as a result of the splendid equipment which has come with Townshend Hall.

This building was built with a view to a larger agricultural college, and Dean Hunt is now gathering a corps of instructors that place Ohio's Agricultural College in the lead.

The development in the dairy department is simply in keeping with the work of the departments of agronomy and animal husbandry.

Grain Weevils.

The common species of grain insects seem to be more than usually abundant this fall, as shown by numerous letters of inquiry received at the Kansas Experiment Station. The two forms most in evidence are the common grain moth and the black weevil, the latter generally more abundant. In either case the most ready method of their destruction is the employment of carbon bisulphide, one pound at least of the liquid to one hundred bushels of grain, or one thousand feet of space.

It seems likely from the varying degrees of success reported with this formula that certain essential conditions are not always strictly observed. In ordinary cribs and bins the most important provision is to make the room as nearly as possible gas-tight, in order that the gas may remain in all parts of the space in full strength and for the required time. It must enter by diffusion all cracks and crevices, even those between the grains of corn in the ear, and must penetrate the burrow of the individual weevil or its grub in the wheat berry. This thorough diffusion will only occur after some time, even in a saturated atmosphere. Twenty-four hours is short enough for certainty, even where the gas can be kept full strength in the bin.

Except with highly organized insects, death does not occur immediately, and partial suffocation may only render the insect insensible, leaving it to recover fully upon the airing out of the bin; or the gradual escape of the gas through cracks in the floor or sides of the bin, allowing the entrance of fresh air, may cause failure through the subsequent revival of the insect. The adult grain moth readily succumbs to the gas, while the larva will stand more and yet revive. The black weevil is most difficult to kill, specimens remaining over night in an experimental killing bottle sometimes recovering when removed therefrom the next day. Hence, to destroy all these it will be necessary to continue the action of the gas in full strength for at least twenty-four hours, and to do this the bin must be made tight, the fluid carbon bisulphide be used in liberal quantities, and in case of doubt, the experiment repeated.

Wheat may be largely kept free from weevil by proper handling, frequent shifting and fanning, such constituting the chief reliance in the elevators. Corn in cribs can scarcely be freed from weevil while remaining there, owing to the practical impossibility of making the crib sufficiently tight. Tarpaulins and stack-covers are useful in assisting to retain the gas within limits, but are by no means tight enough to prevent the escape of the gas by diffusion before the black weevil can be destroyed.

It is suggested by a correspondent that gasoline is equally effective with carbon bisulphide, and owing to its cheapness it can be used in certainly destructive quantities at little expense. It may be necessary to warn those who employ either of these liquids that the gas is highly inflammable and explosive when ignited; hence no fire or light should be allowed about the bin while the fumigation is in progress.—E. A. Popenoe, Experiment Station, Manhattan, Kan., October 22, 1901.

SHEEP.

BY T. L. WHEELER.

Sheep are Ruminants and belong to the family Bovidæ and Genus Ovis.

NATURAL CONDITIONS ESSENTIAL TO SUCCESS.

Wild sheep are inhabitants of mountainous districts, so their natural instincts should be recognized in their domestication. The selection of a suitable farm should be the first care of a person who intends to devote his time and capital to the raising of sheep. To become a successful shepherd requires that a person should have a liking for the business, and possess tact, patience and perseverance sufficient to resist the temptations, which may arise at seasons of depression, to abandon it for some other temporarily more promising pursuit.

Having a determination to stick to his flock he must have a farm suited to its special needs or he will not thrive. Sheep cannot bear dampness, and undrained pastures are fatal to their welfare. Luxuriance of herbage is not generally favorable unless the land is heavily stocked and the pasture kept short and closely cropped. Old permanent pastures in which a variety of grasses are found are better than artificial meadows which form part of a rotation of crops.

The land most suitable for sheep is one that is naturally drained, with a sandy loam or gravelly soil and subsoil, and which bears spontaneously short, fine herbage largely mixed with white clover. It should be rolling and may be hilly in character rather than flat or level.

The character of the soil upon which sheep are pastured has a great deal of influence in modifying the character of the sheep. Upon the kind of soil, of course depends the character of the herbage upon which the flock feeds.

The stocking of the pasture must be closely looked to. Over-stocking causes scarcity of pasture and a deficient supply of nutriment. It also causes the sheep to take up much sand and earth into their stomachs with their food, which gives them an unthrifty appearance and sometimes induces disease and death.

The supply of water is of the greatest importance. A living spring or a clear flowing stream with dry gravelly banks is the best source of supply. Wells are better than ponds or pools. Stagnant water is exceedingly objectionable. Pond or marsh water is highly injurious as is also running water in which aquatic plants are found. It is from drinking such water, as much as from pasturing on undrained soils, that the liver fluke, a parasite always accompanying the disease termed rot, gains access to the stomach and intestines of the sheep.

The exposure of the pasture is another important consideration. Long-continued cold winds are productive of great discomfort and sickness and often cause serious loss amongst the flock. On the seacoast exposure to the moist sea breezes injures the quality of the wool and renders it harsh and deficient in quantity.

CHARACTER OF THE FLOCK.

After a suitable farm has been selected the first thing to do is to select a flock of good ewes and a pure-bred registered ram of the best breed you can get.

The best breed is the one that suits the man ,after he has made a study of the matter, observing the different breeds and their characteristics, as well as his environments, taking into consideration his objects in view—whether he wishes to raise mutton for the general market, to make wool a specialty, or to combine the two; the breed that he likes the best and thinks will make him the most money. In selecting a flock it is best not to purchase pure bred ewes. While purity of breeding is an absolute necessity on the part of the sire it is not as essential on the part of the dam. Purity of breeding on the part of the sire tends to render him prepotent, and because of this prepotency, it gives him the ability to affect improvement. The lack of purity of breeding on the part of the dam takes away her power to resist change in the direction desired when mated with a pure-bred sire; consequently dams of very mixed breeding are excellent material upon which to commence the work of upgrading, so far as blood elements are concerned.

MANAGEMENT OF FLOCK.

The time of coupling will depend on when the lambs are to be sold. The ram should never be allowed to run with the flock, but be kept in the barn during the daytime and put with the flock an hour morning and evening. After the breeding season is over, the ram should be kept entirely away from the ewes.

The ewes should not be allowed to run down in flesh during the winter. Better to have them too fat than too thin at lambing time. Their feed should be of a flesh and muscle-forming nature, such as oats and bran. Clover hay is a good feed for ewes after weaning time. They should be given plenty of exercise in good weather and be well shedded during storms. When the lambs commence coming is the time when the shepherd must be up and stirring. He should visit the flock every few hours, and when the lamb is dropped, it and its mother should be removed to a stall by themselves. See that the lamb takes nourishment before leaving it. Often it is necessary to feed it with a spoon. After it is a few days old and strong enough to follow its mother, they should be turned out with the other sheep.

The little lambs should be taught to eat as soon as possible by keeping feed where they can get it easily. Dock the lambs and castrate the ram lambs when about two weeks old.

As soon as the weather is warm enough the ewes should be sheared. Both ewes and lambs should be dipped in some good sheep dip about two weeks after shearing as the ticks will bother the lambs so much that they will not do so well.

Every flockmaster should sort his ewes early in the fall or autumn before breeding time. All ewes with unsound mouths or injured bags or bad coats should be put by themselves and fed for the butcher as quickly as possible.

It is the opinion of many people that the sheep is an animal that needs but little or no attention. This is true if you take care of them as some people do. The time was, it is true, when the sheep herd did not have as many drawbacks to contend with as at the present time.

HANDLING THE FLEECE.

A sheep should always be caught by throwing the hands about the neck, or by seizing one hind leg immediately

above the hock, with the hand so as not to pull out the wool or spoil the fleece, besides the pain that is given the sheep by catching it by the wool.

The utility of washing sheep before shearing has been the subject of a great deal of discussion. One class of producers advocate it on the ground that it prevents a useless transportation of dirt to market, that it improves the saleableness of wool, and that it avoids the operation of an unequal rule of shrinkage applied by buyers to all unwashed wools. Another class of producers contend that it is injurious to the health of the sheep and that it renders shearing impracticable at that period which best tends both to the comfort and productiveness of the animal and which enables the producer to avail himself of the early wool market.

Whether the wool is washed or not may depend upon the will of the producer.

After the weather has become warm enough the sheep should be sheared. This should always be performed on a smooth, clean floor or platform with the sheep penned close at hand.

The first care of the shearer should be to clip off the wool evenly and smoothly without breaking the fleece and without cutting the wool twice in two, or cutting the skin. It is difficult to avoid the last, occasionally, on the corrugated surfaces of the merino. Especial care should be taken in this respect about the udders of the ewes.

Wool should be cut off reasonably close, but not close enough to have the skin show naked and red, so as to expose it to sunburn or to have the sheep suffer severly from a moderate degree of cold. After the fleece has been removed from the sheep it should be laid upon the folding table with inside ends downward, every part in its natural relative position. All dirt and bad wool should be removed and the fleece folded and tied. Wool should be stored in a clean, dry room, into which neither dust, vermin, nor insects can obtain an entrance.

When it is sold, it is sacked in bales nine feet long formed of two breadths of burlaps from 35 to 40 inches wide. This makes it more convenient to handle, both in handling and shipping.

The Soil and the Plant.

With respect to the general treatment of agricultural subjects in their relation with chemistry, it has been objected that everything not directly connected with the chemistry of the soil has been pushed into a secondary position, the metabolism of the plant and the chemical changes of its constituents being generally very superficially treated and held of not very great interest. While thoroughly agreeing with this criticism, it may nevertheless be useful to read by way of summary, some of the more interesting results gained in recent years in connection with the chemistry of the soil, and its bearing on the physiology of the plant.

There is no doubt, for example, that the condition of the soil, which is dependent very materially on its mineral and chemical components, has a greater influence upon the manner of the development of the roots of a crop than has any inherent peculiarity of the plants. In fact, the roots adapt themselves to circumstances in a greater degree than is commonly imagined, and it happens very often—nay, very generally—that just as the root is so is the plant. Again, the roots behave in a soil rich in humus otherwise than in a soil poor in humus; they endeavor, as it were, to make the most of the humus in all directions, and therefore specially develop a very copiously ramifying root

system to meet the circumstances of the case. This being so, there is no absurdity in the remark that the constitution of the soil in which a plant grows and flourishes acts, or perhaps reacts, on its anatomy as well as on its physiology; on the latter probably through the former. This reaction, however, seems to be mostly confined to temperate climates, for in the tropics the rampant vegetable growth there prevalent at certain seasons does not depend on any inherent fertility of the ground. It is the sun, moist air and enormously rapid nitrification that compensates for the barren, sandy soil, rains, heavy dews and moist winds. Mould is not there formed on the surface, and the ground to a great depth never becomes thoroughly dried up, although no water ever collects on its upper layers except in swampy places.

This distinction between growth in the tropics and growth in our temperate latitudes is a very important one. It cannot be ignored by any student of agriculture. Another distinction is that between the soil and sub soil, the former being that which over a depth of four inches is found directly influenced by the vegetable debris of every kind, such as leaves twigs pink, etc., which cover it; the latter is that which is not perceptibly colored by organic matter, and where roots are found only in small numbers. Sometimes, however, there is very little connection between the soil and subsoil—one foot deep of clay may rest on a fundamental limestone rock; or, occasionally, a purely argillaceous rock may be covered by a soil which encloses a greater or less quantity of fragments of limestone. With regard to soils, the best classification of them in relation to agriculture is perhaps that propounded by Professor Deherain—namely: (1) free, (2) argillo-silicious, (3) argillo-calcareous, (4) argillo-humiferous, (5) clayey, (6) sandy argillaceous, (7) sandy calcareous, (8) sandy humiferous, (9) sandy, (10) calcareous. It will be observed that here the three chief kinds of soil are taken to be clay, sand and lime; but only the two former are regarded as modifiers or diluents, so as to speak, of the whole three, i. e., lime never agriculturally modifies a clay or a sandy soil. This is quite in accordance with what is known as to the process undergone in the disintegration and weathering of the solid rocky skeleton of the earth. In fact, some of the difficulties which attend the artificial manuring of certain lands would be explained or obviated if this fact was duly contemplated.

In order to understand the nature or capabilities of the soil which the cultivation takes in hand, its origin in a chemical or physical sense is by no means the least important consideration.

Thus it is useful to be reminded that to the sand springing from the mechanical disintegration of quartzy or calcareous rocks, to the clay arising from the decomposition of feldspathic rocks, to the oxides of iron and manganese issued from basults or other basic volcanic rocks, there is super-added the residue of the vegetation which follows in their wake. Thus it comes to pass according to Berthelot that "by means of vegetation and owing to the fixation of free nitrogen by micro-organisms, a sandy soil has become converted into a true vegetable soil; natural clays (karlius) also fix free nitrogen." The sandy soils of Brittany furnished with plenty of organic nitrogen, yield immensely increased amounts of root corps when treated with chalk and lime, with gypsum added, the objects of which is to render the nitrates of potass or lime more effective; but in point of fact all that is necessary is to neutralize the acidity of the soil to the depth of a few

'nches, as a certain proposition of lime tends to decrease the humus, all this is connected with the influence of the nitrates on the physiology and general habit, or fancies of the plant.

There is no doubt whatever that it is actually in this particular respect that the study of the chemistry of the soil yields the most important results, and is, as it were, most fully justified. A bulky tome might be devoted to the specific treatment of this branch of the subject, but in this brief paper only a few points can be brought forward. It is in the form of nitrate that potass calcium and soda are most readily absorbed by the plant so as to serve its nutrition. Thus white or black mustard grown in pots in pure sand with minerals, or in water culture, grew well and developed completely when nitrogen was added. With no nitrate the growth was feeble, and the water-culture plants died. Grass, rye, etc., were manured with nitrate alone and again with kainit and superphosphate. It was found that the nitrate plots grew far more luxuriantly than the plots without nitrate, although where phosphates were absolutely wanting in the soil the nitrate manuring did not produce any more nitrogenous matter in the plant, i. e., the forcing action of the nitrates hardly came in evidence if unsupported by phosphates. It would appear that the presence of nitrate in the soil seems to enable the plant to take up more nitrogen in other forms than when the soil is left unmanured or is supplied with sulphate of ammonia. The favorable action of nitrate is evident in every stage of the development of the plants, and they were always the first to ripen. The influence, therefore, of the nitrates of the soil, especially if supported by the phosphates, on the physiology of the plants seems clearly demonstrated.

It is known, moreover, that many plants can store up an excess or reserve of nitrates in the medullary parenchyma and the cortical parenchyma of the stem, especially at the period immediately before flowering, as if they were destined for the special nutrition of the floral parts. This power, is, however, a special peculiarity of certain plants, e. g., nettle, potato, dog's mercury, mustard, spinach and common cabbage. According to Berthelot and André, nitrates of potass is universally present in plants. It is mostly formed in the stem itself, not in the soil or in manues, by cells which behave like nitric ferment. It exists in the tissues of most plants in such a proportion that it must needs be formed in the tissues. The salt of potass represent the phenomena of oxidation, which occur chiefly in the stem and the reproductive organs. It must be observed, however, that for this extraordinary and highly remarkable production of nitrate within the tissues, special microbes of nitrification are absolutely necessary. The ordinary oxidation of the protoplasm or of its waste does not proceed so far; it stops short at the formation of ammoniacal or amido-nitrogen compounds, such as asparagine, glutamine, tyrosine, etc. It is presumed, as a matter of course, that the nitrifying microbes which operate between the tissues are derived and drawn in there from the soil.

Other testimony can be added relative to the subject matter of this paper. "The composition of the soil," says Professor Ville, "influences plant color, size, weight, general aspect, and the amount of carotin and that of chlorophyll. Where nitrogen predominates in plants, as in hemp, wheat, etc., there is the least carotin and chlorophyll when a manure without nitrogen is used. Where potash predominates as in the potato, vine, etc., there is the same effect where

potass is suppressed. The color of the leaves before flowering remains green, or turns yellow, according as the soil is wanting in phosphate, in potass, or in nitrogen. In plants which particularly require nitrogen the leaves turn yellow in its absence. Both chlorophyll and carotin are most intense with full nitrogen. Without minerals both tones are lowered, but not so far as without nitrogen." Mr. Edmond Gaine states that "a high comparative moisture in the soil accelerates the growth especially of the stem and leaves. Inflorescence is retarded either by dry soil or by moist air, and is hastened by moist soil and dry air, especially the latter." It may be interesting to add that dryness of the soil lessens the number of the inflorescences, the number of flowers in each inflorescence, the number of seeds in each fruit and on each plant. On the other hand, it increases the number of ovaries and of fertile ovules in each of the inflorescences. In some, or perhaps in most cases, the number of the fruits which reach maturity, other conditions being favorable, is nearly the same as that of flowers in a dry soil, and only about one-half thereof in a humid soil.

At first sight it might seem that all these most important and interesting reactions of the mere physical conditions or properties of the soil upon the organs of the vegetable were, so to speak, purely mechanical; but as a matter of fact, they are so only indirected. The direct result is a purely chemical effect—that is to say, it is chemical stimuli induced and brought into action by the flow of plastic material, owing to the moister condition of the tissues growing in a humid soil or vice versa in a dry soil. Thus, for instance, in the research of M. Prunet on the potato tuber it was observed that the distribution of the immediate principles—starch, etc.,—and of the mineral matters of reserve in the different regions of the tuber is much more uniform in a humid, and more diverse, according to the region, in a dry soil. It is not, of course, insisted that humid conditions are physiologically more favorable to annuals and perennials than drouthy conditions. The effect of the former is to arrest physiological differentiation; the latter accentuates it, and so not merely prolongs the individual career (oaks live one-third as long again in a dry soil), but also ameliorates the quality of its offspring, the seeds.—Dr. P. I. Keegan, in Science Gossip.

Annual Report of the Secretary of Agriculture, 1901.

The fifth annual report of the Secretary of Agriculture, Hon. James Wilson, is considerably larger than in former years, reflecting thereby the great growth and development which has attended this Department during his administration.

WEATHER BUREAU.

He announces an important extension of the forecast field of the Weather Bureau, which now includes reports from certain points in the British Isles and on the continent of Europe, form the Azores, Nassau, Bermuda, and Turks' Island. The Atlantic forecasts based upon these reports now form part of the regular night forecasts issued in Washington. Three new forecast districts have been established—in Boston, New Orleans, and Denmark. An extension of the forecast to farmers through the Rural Free Delivery is contemplated. Substantial improvements are reported has direct relation to the important agricultural interests of the communities in which they are located.

THE OFFICE OF EXPERIMENT STATIONS.

The Secretary reports as the result of a broad inquiry made through the Office

of Experiment Stations that by far the largest part of the work of the stations

The work of the stations is becoming better understood by the farmers, and a broader, deeper foundation of scientific inquiry is being laid each year. Co-operation between this Department and the stations continues to increase, and the value of these co-operative methods to the agricultural interest are very generally acknowledged. As a result of the practical confidence so attained, Congress and the State legislatures have shown a disposition to be liberal with this Department and with the stations. The movement for the separation of the office of director of the stations from that of president of the college has advanced, and at present there are but eleven States and Territories in which the college president exercises the functions of director of the station. At the same time, the amount of teaching required of station officers has been materially reduced.

IRRIGATION MATTERS.

The Secretary devotes a great deal of space to a discussion of irrigation investigations. These have been conducted through the Office of Experiment Stations, and embrace (1) studies of irrigation laws and the social and industrial institutions of irrigated agriculture, (2) investigations of the methods by which water is conserved, distributed, and used.

WORK IN ENTOMOLOGY.

Under this head the Secretary reports the successful introduction and establishment in California of the fig-fertilizing insect, with the result that it has been thoroughly established at several points, and that the Division of Entomology is now ready to supply fig insects to any grower after he has succeeded in raising to the bearing stage caprifig and Smyrna fig trees. The discovery is reported by an expert of the division sent to Asia for the purpose, that the San Jose scale is not indigenous to the Japan, but that it is so in North China. It has been found in a section of that country where there have been no fruit importations, and all fruits are of native sorts. Further, in this district, it was found to have a natural enemy—a ladybird beetle, of which the expert in question has collected many specimens and forwarded them to Washington, and steps will be taken to acclimatize this important species. This importation will doubtless prove of extreme value to friut growers in this country. Another valuable importation of the ladybird beetle was of one which feeds upon several distinct species of plant accidentally imported into this country from Europe.

PUBLIC ROADS.

In establishing an Office of Public Road Inquiries, the object was to promote the improvement of public roads throughout the country. Efforts were first directed to ascertain the condition of the roads, the state of public opinion in regard to their improvement, the obstacles in the way, and the best methods to be employed in securing better roads —such has been the work of this office up to the present. For spreading information and awakening interest, nothing has been found so effectual as the "object-lesson" or sample roads which, during the past year, have been built in nine States under the advice and supervision of the office. In building these sample roads, machines have been loaned by manufacturers and carried free by the railroad companies, while the local community furnishes material and labor. During the year, for the better carrying out of the work of the office, the United States was divided into four divisions, the eastern, middle, western, and southern, each under a special agent.

ANIMAL INDUSTRY.

A large portion of the report covers the subject of animal industry. The grand total of animals and animal products exported during the year exceeded $250,000,000 in value. This vast foreign market is only preserved to our producers by the indefatigable efforts of the Department and the rigid inspection exercised through the Bureau of Animal Industry. This Bureau inspected for export 385,000 cattle, 228,000 sheep, and 48,000 horses and mules, and nearly 1,000 vessels carrying live stock. Imported animals were also inspected to the number of 342,000, and, where necessary, quarantined. The Secretary suggests that with the enormous interests our stock-raisers have at stake, and inspection or quarantine affording after all, a relative, not an absolute guarantee of protection, it might be well for this country to follow the example of Great Britain and exclude live stock from other countries entirely. The meat inspection service involved the inspection at time of slaughter of nearly 37,000,000 animals. Of the more than 5,000,000 cattle inspected, the condemned carcasses were about one-fourth of 1 per cent.; of the 6,500,000 sheep, one-tenth of 1 per cent.; and of 24,000,000 hogs, one-third of 1 per cent. In the control of indigenous diseases, 1,500,000 inspections were made and over 45,000 cars disinfected in the Texas fever service alone. In the repression of scabies in sheep nearly 8,000,000 animals were inspected, and over 1,000,000 dipped under the supervision of the Department inspectors. In combating the disease known as "Black Leg" the Bureau distributed over 1,500,000 doses of vaccine, the result being to reduce losses in affected herds to less than 1 per cent., where formerly it was in most cases about 10 per cent. To aid in detecting tuberculosis in cattle and glanders in horses, over 44,000 doses of tuberculin and 7,000 doses of mallein have been supplied. The Secretary points out the serious evil resulting from a system of State inspection which, if it became general, would effectually prevent the marketing of live stock in some sections, and would destroy much of the usefulness of the Federal inspection. He regards the present conditions as so menacing to the interests of the cattle industry in the West and Southwest that he has requested the Attorney General to co-operate in bringing the matter before the Supreme Court for decision as to the constitutionality of these State laws.

This request has been favorably received and the assistance of the Department of Justice promised.

PLANT INDUSTRY.

The organization of the Bureau of Plant Industry is reported. It has brought together in one group Investigations in Plant Physiology and Pathology, Botany, Grasses and Forage Plants, Pomology, and the Experimental Gardens and Grounds, including the Experimental Farm at Arlington and the Introduction of Foreign Seeds and Plants. The work of each division is reviewed in full.

SOIL SURVEY.

An extensive review of the work of soil survey shows that the areas surveyed and mapped during the year exceeded 3,500,000 acres, making a total of nearly 6,000,000 acres surveyed during the past two years. The field work, including preparation of reports, transportation, and supplies, has cost an average of $3.26 per square mile, or about 51 cents per hundred acres. A part of the expense has been paid by State organizations, and effective cooperation has been had with the stations. The demands for soil survey in various parts of the country continue to be received in excess of the ability of the Bureau to

comply. The Secretary enumerates sundry important results in the work of the Survey, but dwells especially upon what has been achieved in connection with tobacco. Especially successful have been the experiments made by the Bureau in the growing of a fine type of Sumatra leaf on certain soils in the Connecticut Valley. During the past year nearly 43 acres have been grown under the direct control of the Department experts. An interesting feature of the experiment is that the bulk of the cost, estimated at $20,000, has been invested by the farmers themselves, and it is gratifying to record that their enterprise has been rewarded far beyond their expectations. The recommendations of the Department have also been followed in the methods of curing tobacco in Pennsylvania, with the result of effecting a saving from the ravages of the black rot.

WORK OF THE BUREAU OF FORESTRY.

Another of the newly-organized bureaus is that of Forestry. The Secretary reports that this Bureau is co-operating with the Federal Government, with several States and many private owners in handling their forest lands. Altogether, assistance has been asked for a total area of 52,000,000 acres, of which 4,000,000 are held by private owners. The work of forest management is reviewed in some detail. During the year nearly 800,000 acres under private owners were examined by representatives of the Bureau, and four detailed working plans, covering 226,000 acres were prepared. The working plan for the Black Hills forest reserve was completed and working plans were undertaken for the Prescott and Big Horn, and the Priest River reserves.

Forest investigations include the study of commercial trees, and economic tree planting, of forest fires, grazing, lumbering, forest productions, and other important lines. The region containing the proposed Appalachian forest reserve was examined in co-operation with the United States Geological Survey and nearly 10,000,000 acres were mapped, lands classified, and the forests carefully studied. The Secretary regards the creation of the proposed forest reserve as urgent in order to protect the head waters of important streams, to maintain the already greatly impaired supply of timber, and to provide a national recreation ground. Upon the request of the Secretary of the Interior, the effects of grazing and forest fires were investigated on twelve of the forest reserves.

In the study of economic tree planting in co-operation with farmers and others in making forest plantations, 46,145 acres were examined and plans were prepared for nearly 6,000 acres, while 148,000 applications for tree-planting plans were received.

EXPORTATION OF AGRICULTURAL PRODUCTS.

The highest record previously attained in the export of agricultural products —in 1898—was surpassed by over $90,000,000 in the fiscal year of 1901, when a value of over $950,000,000 was reached. Of the merchandise sent abroad during the year, 65 per cent. originated on the farm. Of foreign customers for our agricultural products, the United Kingdom stands first, taking over 50 per cent. The next most important markets are afforded by Germany, France, the Netherlands, and Belgium, in the order named. The Section of Foreign Markets has begun the preparation of a most comprehensive report on the character of our agricultural importations received by the United Kingdom from countries other than the United States. The importance of this report is evidenced by the fact that, large as were our exports to the United Kingdom, they comprised only one-third of the foreign farm produce purchased by that

country. Special statistics have been compiled by the Section of Foreign Markets relative to our trade in farm products with our new insular possessions. Our agricultural exports to Cuba, Porto Rico, and the Philippines during the year comprised about 53 per cent. of the domestic merchandise sent to these islands. Our imports of agriculture products from these islands exceeded our exports by just $30,000,000.

BIOLOGICAL SURVEY.

The Survey is engaged in mapping the natural boundaries of the crop belts of the country. Its aim is to furnish farmers with lists of products likely to be successful, so far as climatic conditions go, in different parts of the country. During the past season the work mapping the life zones and crop belts has been continued, particularly in Texas and California. A fiber plant, closely related to the Mexican istle or Tampico plant, is found growing in great abundance over a large part of the arid Sonoran zone. In view of the great quantity of fiber of other species of agave imported into this country ($12,000,000 worth in 1900) the Texas species is likely to prove of great value.

THE DIVISION OF STATISTICS.

The work of this Division consists largely in the preparation of reports relative to the principal products of the soil, including the extent and geographical distribution of the area of production, the condition and prospects of the crops during the growing season, and the quantity, quality and disposition of the products harvested. It has included also reports on various branches of rural economics, such as transportation, wages of farm labor, co-operation in agricultural industries, etc. An urgent demand exists for broadening the scope of the work of this Division. But this can not be done without enlarging its appropriations. Telegraphic interchange of crop reports has been arranged for with the governments of some of the principal grain-growing countries of Europe. In furtherance of the plan to place the crop reports in the hands of the farmers as early as possible, a system of cards containing the most important points of the Statistician's monthly report has been adopted. These cards are mailed promptly after the publication of the telegraphic summary to postmasters throughout the country with the request that they be promptly displayed in their offices. The Secretary recommends the enlargement of the Division under Bureau organization.

CONCLUSION.

The report concludes with a review of the development of agriculture and commerce during the past twenty years, and of the contributions by the Department of Agriculture to the progress of events and the building up of domestic and foreign trade. The Secretary says that coincident with this growth numerous institutions have grown up in this country and abroad, devoted to the application of science to the service of agriculture, thus creating a great demand, at good salaries, for the right sort of men. Each nation is seeking to extend its productions, and is depending more and more upon the aid of science. Men combining knowledge with practical experience and ability are hard to get, hence the Department has to face the necessity of paying much higher salaries or of being compelled to either lose opportunities of getting the best men or to lose some of those who, under its training, have developed such qualities as make them exceptionally valuable.

He concludes by saying that he would urge upon Congress, in the strongest terms and for the best interest of the country, such liberality as will enable him to obtain and retain the best men that can be found to fill the important places at his disposal.

To have what we want is riches, but to be able to do without is power.—MacDonald.

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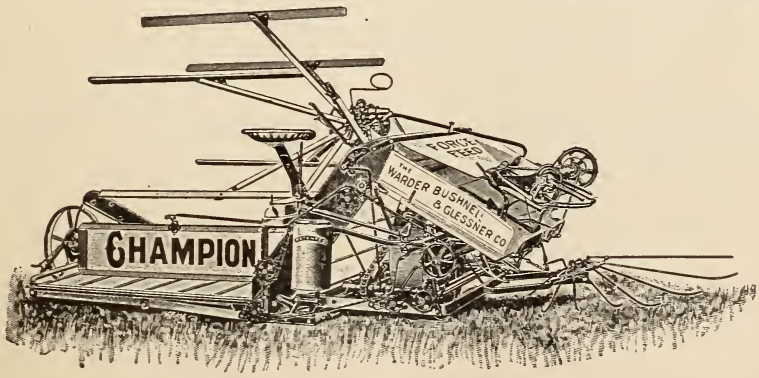

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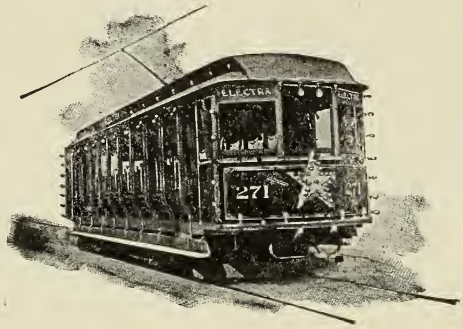

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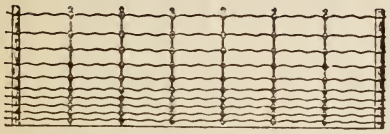

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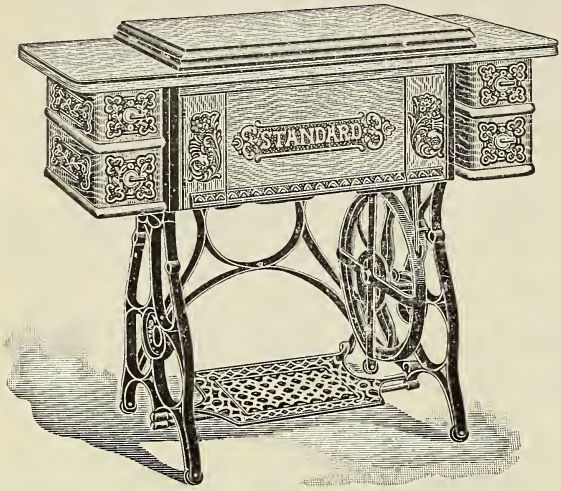

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